OCR
RECOGNISING ACHIEVEMENT

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B621/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

SCIENCE B

Unit 1 Modules B1 C1 P1 (Higher Tier)

THURSDAY 5 JUNE 2008

Morning
Time: 1 hour

CUP/T52441

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- A list of physics equations is printed on page two.
- The Periodic Table is printed on the back page.

FOR EXAMINER'S USE		
Section	**Max.**	**Mark**
A	**20**	
B	**20**	
C	**20**	
TOTAL	**60**	

This document consists of **22** printed pages and **2** blank pages.

[Turn over

EQUATIONS

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

energy = mass $\times$ specific heat capacity $\times$ temperature change

energy = mass $\times$ specific latent heat

fuel energy input = waste energy output + electrical energy output

power = voltage $\times$ current

energy supplied = power $\times$ time

energy (kilowatt hours) = power (kW) $\times$ time (h)

wave speed = frequency $\times$ wavelength

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Question 1 starts on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

Section A – Module B1

1 Karen sees a chart in a magazine.
The chart can be used to calculate the percentage of alcohol in her blood after she drinks some alcoholic drinks.

	percentage of alcohol in the blood								
body mass in kg \ units of alcohol drunk	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
50	.04	.08	.11	.15	.19	.23	.26	.30	.34
60	.03	.06	.09	.12	.16	.19	.22	.25	.28
70	.03	.05	.08	.11	.13	.16	.19	.21	.24
80	.02	.05	.07	.09	.12	.14	.16	.19	.21
90	.02	.04	.06	.08	.11	.13	.15	.17	.19
100	.02	.04	.06	.08	.09	.11	.13	.15	.17
110	.02	.03	.05	.07	.09	.10	.12	.14	.15
120	.02	.03	.05	.06	.08	.09	.11	.13	.14

□ = below legal driving limit ■ = above legal driving limit

A single measure of spirits  or a half pint of beer  contains 1 unit of alcohol.

(a) Karen drinks the following:



a single measure of spirits a half pint of beer a pint of beer

(i) Work out the number of units that Karen has drunk.

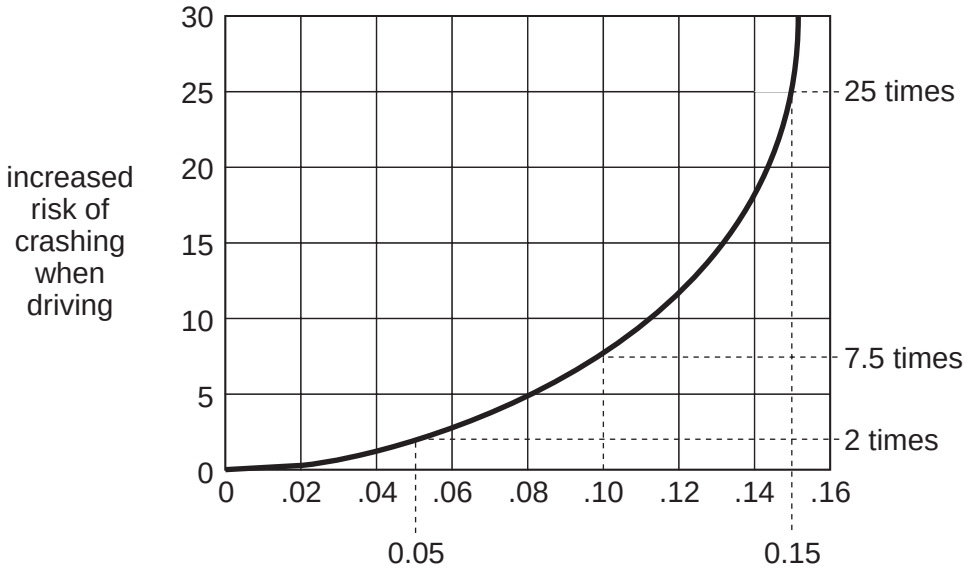
answer ..... units [1]

(ii) Karen has a body mass of 90 kg.

Use the chart to find the percentage of alcohol in Karen's blood after drinking these drinks.

answer ..... % [1]

(iii) This graph is from the same magazine.



Karen's friend Belinda has also been drinking alcohol.

The percentage of alcohol in her blood is 0.13%.

What advice would you give Belinda about driving after drinking these drinks?

Explain your answer using the chart and the graph.

.....

.....

.....[2]

(b) The alcohol in Belinda's blood could affect her driving.

Put a tick (✓) in the box next to the way that alcohol has this effect.

acting as a depressant by blocking her synapses ☐

acting as a stimulant by increasing the efficiency of her receptors ☐

acting as a stimulant by making her muscles contract ☐

acting as a depressant by acting as a transmitter at her synapses ☐

[1]

[Total: 5]

2 Garry likes eating peanuts.

He looks on the back of his peanut packet.

He finds a list of some of the nutrients that are found in the peanuts.

100 g of peanuts contains:	
protein	7.4 g
carbohydrate	2.1 g
fat	15.9 g
fibre	1.8 g

(a) When Garry eats the peanuts, they are digested in his digestive system.

(i) Why do some of the nutrients need to be digested?

.....

.....[1]

(ii) Finish the sentences about how fat is digested in Garry's digestive system.

Fat digestion starts in the ..... .

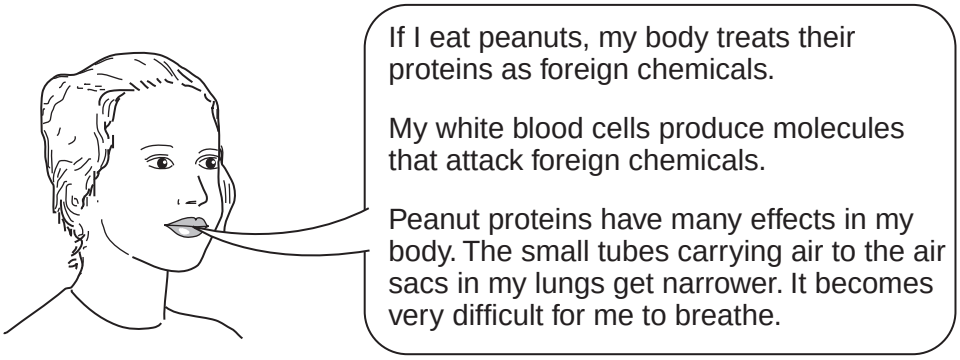
This is caused by the enzyme ..... .

The release of ..... increases the rate of digestion by increasing the surface area of the fat droplets.

[3]

(b) Garry has a friend Julie.

Julie is allergic to peanuts which makes her ill if she eats them.



Write down scientific words that mean the same as these words in Julie's description.

Choose your scientific words from this list.

acids **antibiotics** **antibodies** **antigens**

bronchioles **capillaries** **trachea**

(i) the foreign chemicals .....

(ii) the molecules that attack foreign chemicals .....

(iii) the small tubes carrying air to the air sacs .....

[3]

[Total: 7]

3 Read the following description about a new discovery by scientists.

Then, answer the questions that follow.

Scientists have been investigating how ultraviolet (UV) radiation in sunlight can cause mutation.
They have been shining UV radiation at the bases in DNA.
They have found that at least two of the bases, **C** and **T**, can take in the energy from UV light.
The bases then hold on to the energy for longer than originally thought.
The scientists think that this increases the chances of a mutation occurring.

(a) The scientists found results for the bases **C** and **T**.

What letters represent the **other two** bases that are found in DNA?

..... and ..... [1]

(b) When DNA absorbs energy, it might mutate.

How may the structure of DNA change in a mutation?

.....

.....[1]

(c) Why can a mutation change how a cell functions?

.....

.....[1]

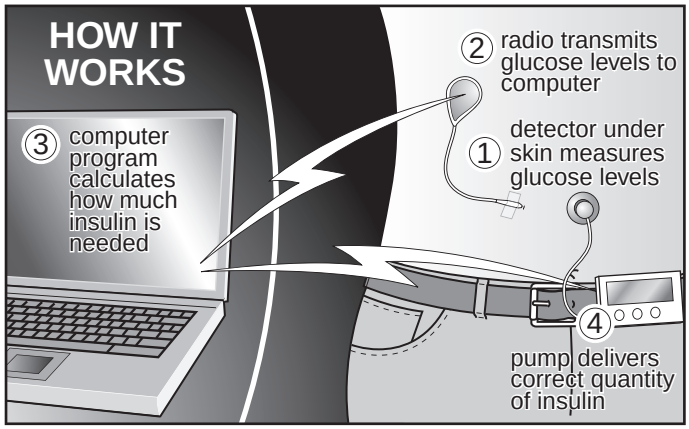
(d) Radiation such as UV light can cause mutations.

Apart from UV radiation, write down **one other** cause of mutations.

.....[1]

[Total: 4]

4 Some people need to inject themselves with insulin.
They need to know the correct dose of insulin needed.
They have to prick their skin to get a drop of blood to measure their blood sugar level.
Scientists have now developed a new system.



adapted from The Times, 6 November, 2006.

This system allows blood to be continuously monitored.
The pump can then give the correct dose of insulin.

(a) Why do some people need to take insulin?

.....[1]

(b) What does insulin do in the body?

Put a tick (✓) in the box next to the correct answer.

converts excess glycogen in the liver to glucose ☐

makes the cells in the pancreas take up less glucose ☐

converts all the glucose in the blood into glycogen in the pancreas ☐

converts excess glucose to glycogen in the liver ☐

[1]

(c) The new device adjusts the amount of insulin delivered to the person throughout the day and night.

Explain why the amount of insulin the body needs will vary at different times of the day and night.

.....

.....

.....[2]

[Total: 4]

Section B – Module C1

5 Some foods contain additives.

Look at the table. It gives some information about E numbers.

type of food additive	E number range
food colour	E101 to E199
preservative	E200 to E299
antioxidant	E300 to E321
emulsifiers and stabilisers	E322 and E400 to E499
sweeteners	E950 to E967

(a) What type of food additive is E160?

.....[1]

(b) Emulsifiers help oil and water to mix.

(i) Write down the name of a food that contains an emulsifier.

Choose from the list.

lemonade

mayonnaise

orange squash

potato chips

answer .....[1]

(ii) Describe how an emulsifier helps to keep the oil and the water from separating.

You may wish to draw a diagram.

.....

.....

.....[2]

(c) **Active packaging** is used to improve the quality or safety of food.

Write down one example of how active packaging is used to improve the quality or safety of food.

.....[1]

(d) Some foods must be cooked before they are eaten.

Write down **two** reasons why.

1 .....

2 .....[2]

[Total: 7]

6 Crude oil is a fossil fuel that is found in the Earth's crust.
It is pumped to the surface in an oil well.

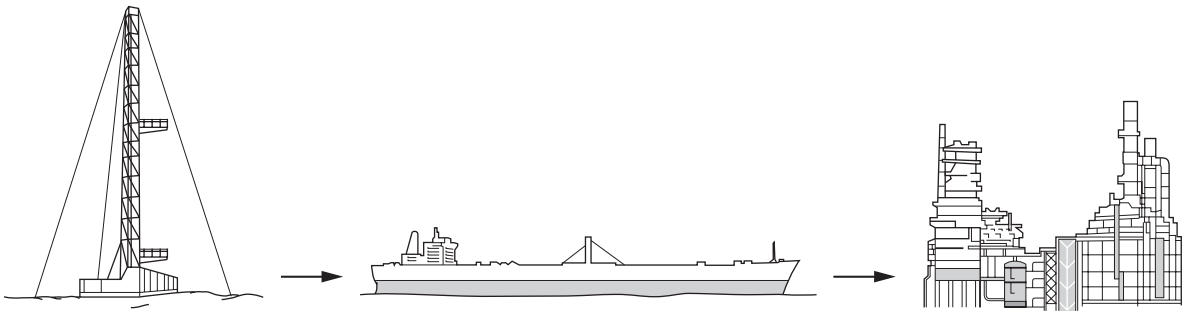
(a) Crude oil is a **non-renewable** fuel.

Explain why.

.....

.....[1]

(b) Look at the diagram. It shows how crude oil is transported from an oil well to a refinery.



oil well in the Middle East

oil tanker taking crude oil to the United Kingdom

oil refinery in the United Kingdom

(i) Crude oil is transported in a ship to oil refineries.
Sometimes these ships have accidents and crude oil spills out.
These spills make **oil slicks**.

Explain why oil slicks are a problem.

.....

.....[1]

[Turn over for the remainder of question 6

(ii) One of the processes that happens in an oil refinery is fractional distillation.

Look at the table.

It shows the amount of each fraction made from 100 tonnes of crude oil.

It also shows the amount of each fraction needed for everyday uses.

fraction	amount made in tonnes	amount needed in tonnes
LPG	5	10
petrol	10	25
naphtha	10	5
paraffin	15	10
gas oil	5	5
fuel oil	40	30

Which fraction exactly matches the amount made to the amount needed?

Choose from the table.

.....[1]

(iii) Another process that happens in an oil refinery is cracking.

Cracking converts large fractions into smaller fractions.

Explain why cracking is needed. Use the table to help you.

.....

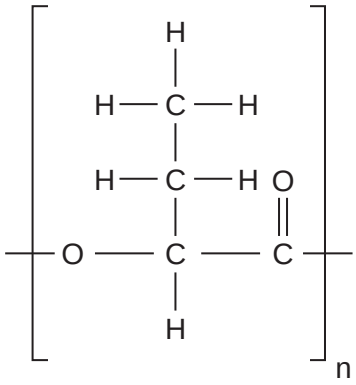
.....[2]

[Total: 5]

7 This question is about polymers.

(a) Look at the structure of a new polymer.

It is biodegradable.



This polymer is **not** a hydrocarbon.

Explain why.

.....

.....[1]

(b) Gore-Tex® is used to make waterproof clothing.

It is made of nylon with an outer layer of PTFE / polyurethane.

The PTFE has small holes in it.

(i) The holes make Gore-Tex® waterproof and breathable.

Explain how.

.....

.....[2]

(ii) The PTFE layer is combined with nylon.

Explain why.

.....

.....[1]

[Total: 4]

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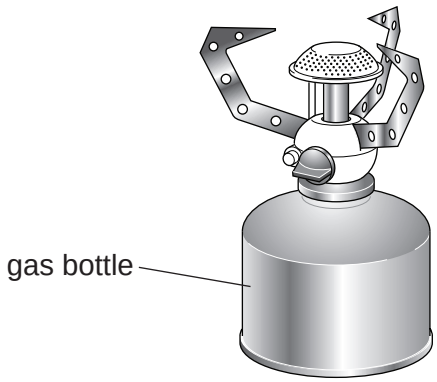
8 This question is about fuels and combustion.

(a) Look at the diagram of a camping stove.



A fuel is stored in the gas bottle.

Many factors need to be considered when choosing a fuel for this camping stove.

One factor is whether the fuel is expensive or not.

Write down **two** other factors that need to be considered.

1 .....

2 .....[2]

(b) Methane can be used as a fuel.

Methane, CH_4, burns in oxygen, O_2.

Carbon dioxide and water are made.

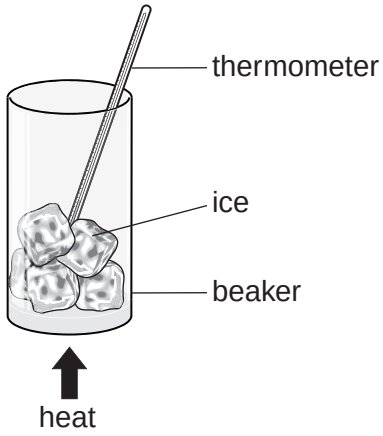
Write a balanced **symbol** equation for this reaction.

.....[2]

[Total: 4]

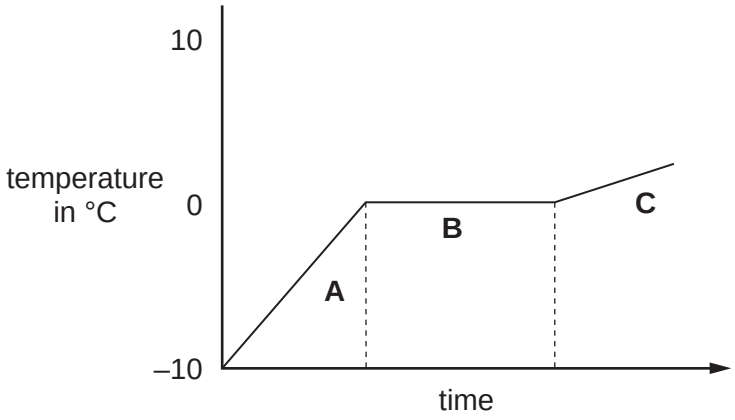
Section C – Module P1

9 Dave collects some ice from the freezer.



He heats the ice with a Bunsen burner and measures the temperature.

Look at the graph of his results.



(a) The ice melts in part **B**.
There is no change in temperature when the ice is melting even though the Bunsen burner is still heating the ice.

What is the energy from the Bunsen burner used for when the ice is melting?

.....

.....

.....[2]

(b) Look at the energy statements **A**, **B**, **C** and **D** below.

A the energy needed to raise the temperature of 1 kg of ice by 1 °C

B the energy needed to heat ice

C the energy needed to melt 1 kg of ice

D the energy needed to cool ice

(i) Which letter describes the **specific latent heat** of ice?

Choose from the list.

A B C D

..... [1]

(ii) Which letter describes the **specific heat capacity** of ice?

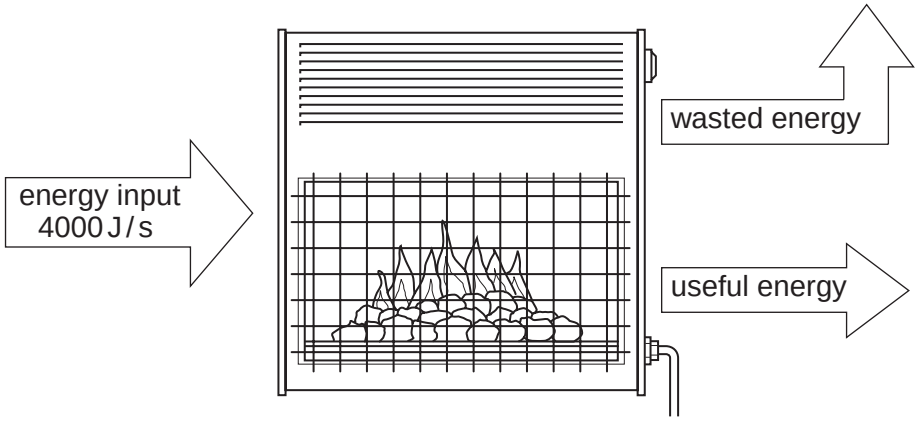
Choose from the list.

A B C D

..... [1]

[Total: 4]

10 (a) Sandra uses a gas fire to heat her house.



The energy input to the fire is 4000 J each second.

Her gas fire is 80% efficient.

Some of the energy is wasted.

Calculate how much energy is **wasted** each second.

The equations on page 2 may help you.

.....

.....

.....

energy wasted each second = ... J [3]

(b) Look at the information about fitting insulation to Sandra's house.

insulation method	cost to fit in £	money saved each year in fuel bills in £	payback time in years
loft insulation	200	100	
double glazing		50	40
shiny foil behind radiators	5	10	0.5

(i) Calculate the payback time for loft insulation.

.....

answer ..... years [1]

(ii) How much did it cost Sandra to fit double glazing?

.....

answer £ ..... [1]

[Total: 5]

11 Exposure to the Sun can cause a suntan.

This exposure can also cause skin cancer.

Gordon and Sally like to sunbathe.

Gordon Sally

(a) Gordon's skin is **darker** than Sally's.

Because of this, he has **less** chance of getting skin cancer.

Explain why.

.....

.....[2]

(b) Gordon and Sally decide to use sun cream.

Sally needs to know how long she can safely stay in the Sun.

Without sun cream, Sally can safely stay in the Sun for just 10 minutes.

She wants to stay in the Sun for 200 minutes.

Which sun factor cream should she use?

Choose from the list.

5 10 15 20

..... [1]

(c) The ozone layer can protect people from harmful radiation.

(i) How does the **ozone layer** protect people?

.....

.....[1]

(ii) The ozone layer can be depleted.

What causes this?

.....

.....[1]

[Total: 5]

12 Microwaves are used for communication.

(a) These waves have a high frequency.

What does frequency mean?

.....[1]

(b) Mobile phones use microwave signals.

These **microwave signals** may cause problems.

Suggest **two** problems.

1 .....

2 .....[2]

(c) Television signals can be analogue or digital.

Some televisions only receive digital signals.

(i) What is a **digital** signal?

.....

.....[1]

(ii) More information can be carried by digital signals than analogue signals.

Explain why more information can be carried.

.....

.....[1]

(iii) Digital televisions have better pictures than analogue televisions.

There is less interference with digital signals.

Explain why.

.....

.....

.....[1]

[Total: 6]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.*

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.